



## Original article

# Intravesical prostatic protrusion correlates well with storage symptoms in elderly male patients with non-neurogenic overactive bladder



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## ABSTRACT

**Objective:** The aim of the study was to investigate the correlation between the subjective symptoms and parameters of urodynamic and imaging studies in male patients with non-neurogenic overactive bladder (OAB).

**Materials and methods:** We prospectively recruited male patients with OAB between January 2008 and June 2012. Patients with neurological comorbidities were excluded. We used the International Prostate Symptom Score (IPSS) and the Overactive Bladder Symptom Score (OABSS) to evaluate subjective symptoms. All patients underwent pressure-flow urodynamic studies. All patients received trans-abdominal ultrasound, which provided the information about intravesical prostatic protrusion (IPP), prostate volume, and detrusor wall thickness (DWT).

**Results:** A total of 122 patients were enrolled. The mean age of the patients was  $72 \pm 13$  years. The mean total score, voiding subscore, and storage subscore of IPSS, and OABSS were  $16.8 \pm 7.3$ ,  $7.2 \pm 4.8$ ,  $9.7 \pm 3.4$ , and  $9.8 \pm 3.1$ , respectively. Total score, voiding subscore, and storage subscore of IPSS were all negatively correlated with catheter-free maximum and average flow rate. Furthermore, storage subscore of IPSS was negatively correlated with cystometric capacity, and positively correlated with postvoid residual urine. OABSS was negatively correlated with cystometric capacity and catheter-free maximum flow rate. In bladder outlet obstruction (BOO) patients, total score and storage subscore of IPSS and OABSS were positively correlated with IPP. There was no correlation between symptom scores and other urodynamic parameters, prostate volume, and DWT.

**Conclusion:** In elderly male patients with non-neurogenic OAB, more severe storage symptoms are associated with a lower maximum flow rate and a more prominent IPP, indicating that a significant cause of male non-neurogenic OAB is prostate associated.

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## 1. Introduction

According to the International Continence Society, overactive bladder (OAB) is a syndrome of storage symptoms defined as urgency, with or without urge incontinence, usually associated with daytime frequency and nocturia.<sup>1,2</sup> The European Prospective

Investigation into Cancer and Nutrition study, a population-based cross-sectional study, reported that the overall prevalence of OAB is 11.8%.<sup>3</sup> The recent OAB on Physical and Occupational Limitations study in the United States reported that the prevalence of OAB was 16.4% and 30.0% among men and women, which increased with advanced age.<sup>4</sup>

Blaivas et al<sup>5</sup> suggested that most men with OAB also have coexisting urological problems. Their data showed that the most common diagnoses were benign prostatic enlargement (32%), bladder outlet obstruction (BOO; 22%), and complications following prostate cancer treatment (20%). Idiopathic OAB was diagnosed in only 5% of their study population. Furthermore, between 46% and

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66% of men with prostatic obstruction on urodynamic studies were diagnosed with detrusor overactivity.<sup>6,7</sup>

A previous study had proved that intravesical prostatic protrusion (IPP) was a significant predictor of BOO.<sup>8</sup> By contrast, storage symptoms could be secondary to BOO. Thus, it is valuable to know whether there is a significant correlation between IPP and storage symptoms in male OAB patients. In this study, we investigated the correlation between the subjective symptom score and objective parameters of urodynamic and imaging studies in male patients with non-neurogenic OAB.

## 2. Materials and methods

We prospectively recruited male patients with OAB symptoms from our urology outpatient clinic between January 2008 and June 2012. The study protocol was reviewed in advance by the Ethics Committee of our hospital before any patients were recruited. Informed consent was obtained from each patient prior to participation in this study. All patients were interviewed to obtain detailed personal and medical histories. Patients with overt neurological disorders (e.g., spinal cord pathology) were excluded.

Symptom severity was evaluated before medical treatment (including treatment with antimuscarinic agent,  $\alpha$ -blocker, or 5 $\alpha$ -reductase inhibitor) or surgery using the International Prostate Symptom Score (IPSS) and Overactive Bladder Symptom Score (OABSS) questionnaires. The IPSS questionnaire consists of seven questions, each rated on a severity scale of 0–5. The summed scores of each of the questions were the total score (IPSS-T). A subtotal score for Question 1 (incomplete emptying), Question 3 (intermittency), Question 5 (weak stream), and Question 6 (straining) was designated as the “voiding symptom score (IPSS-V).” A subtotal score for Question 2 (voiding frequency), Question 4 (voiding urgency), and Question 7 (nocturia) was designated as the “storage symptom score (IPSS-S).” Scores of 0–7, 8–19, and 20–35 represent mild, moderate, and severe lower urinary tract symptoms, respectively. The OABSS is a four-item questionnaire developed to evaluate OAB symptoms. The maximal scores are 2, 3, 5, and 5 for daytime frequency, nighttime frequency, urgency, and urgency incontinence, respectively.

All patients underwent catheter-free uroflowmetry, postvoid residual (PVR) urine measurement, and urodynamic pressure-flow studies. Bladder Outlet Obstruction Index (BOOI) was calculated using the following formula: pressure at maximum flow ( $P_{\text{det}Q_{\text{max}}}$ ) – 2 × maximum flow rate ( $Q_{\text{max}}$ ). Male BOO was defined as BOOI >40.<sup>9</sup>

All patients received transabdominal sonography, which provided information on prostate volume, IPP<sup>8,10</sup> and detrusor wall thickness (DWT).<sup>11</sup> The prostate volume was calculated using the ellipsoid formula method ( $0.52 \times \text{width} \times \text{height} \times \text{depth}$  of the prostate). IPP and DWT were measured under the bladder volume of 150–200 mL.<sup>12</sup> IPP was defined as the vertical distance between the tip of prostate protrusion and the bladder base, and was graded as follows: Grade 1,  $\leq 5$  mm; Grade 2,  $>5$ –10 mm; and Grade 3,  $>10$  mm.<sup>8</sup> DWT was defined as the hypoechogenic distance between the bladder mucosa and adventitia at the anterior bladder wall.<sup>11</sup>

A  $p$  value < 0.05 was considered statistically significant. Spearman correlation coefficient was carried out to determine the correlations between subjective symptom score and objective urodynamic parameters. These patients were further divided into the BOO and non-BOO groups. Correlation between symptom score and image parameter was carried out. Statistical analyses were performed using SPSS 15.0 statistical software (SPSS Inc., Chicago, IL, USA).

## 3. Results

The mean age of the patients was  $72 \pm 13$  years. Among these patients, 102 (83.6%) patients were >60 years of age and 114 (93.4%) patients were >50 years of age. The mean-free  $Q_{\text{mean}}$  and  $Q_{\text{max}}$  were 7.4 mL/s and 14.7 mL/s, respectively (Table 1). The mean cystometric capacity was  $176.4 \pm 120$  mL and the mean PVR urine measurement was  $59.5 \pm 93.9$  mL. The average BOOI was 45.4 and the prevalence of BOO in male patients with OAB was 51.6%. The mean prostate volume was  $39.1 \pm 20.1$  cm<sup>3</sup>. The mean IPSS-T, IPSS-V, and IPSS-S were  $16.8 \pm 7.3$ ,  $7.2 \pm 4.8$ , and  $9.7 \pm 3.4$ , respectively. Furthermore, 12 (9.8%) patients had mild, 69 (56.6%) patients had moderate, and 41 (33.6%) patients had severe lower urinary tract symptoms. The mean OABSS was  $9.8 \pm 3.1$ .

### 3.1. Correlation between symptom score and catheter-free uroflowmetry

IPSS-T, IPSS-V, and IPSS-S were all negatively correlated with catheter-free average (free  $Q_{\text{mean}}$ ) and maximum flow rate (free  $Q_{\text{max}}$ ; Table 2). Nevertheless, OABSS was negatively correlated with free  $Q_{\text{max}}$  only.

### 3.2. Correlation between symptom score and pressure-flow study

IPSS-S was correlated with cystometric capacity and PVR urine measurement. OABSS was correlated with cystometric capacity alone. There was no correlation between IPSS-T, IPSS-V, and the parameters of pressure-flow study (Table 3).

### 3.3. Correlation between symptom score and image parameters in BOO patients

IPSS-T, IPSS-S, and OABSS were correlated with IPP in BOO patients. Nevertheless, IPSS-V was not correlated with image parameters, including prostate volume, IPP, and DWT (Table 4).

## 4. Discussion

OAB symptoms are common and troublesome among the lower urinary tract symptoms and often cause patients to seek medical treatment. In men aged > 40 years, the prevalence of OAB is 15–60%.<sup>13</sup> The rate increases to 80% in men over the age of 80 years.<sup>14</sup> The pathophysiology of OAB is complicated and detrusor hyperactivity is thought to be the most common cause of OAB symptoms.<sup>15</sup> In male patients, there are many conditions that could contribute to OAB symptoms,<sup>16</sup> and age and BOO are independently associated with detrusor overactivity in patients with benign prostate hyperplasia.<sup>5,17</sup> Elderly patients formed the majority of our study population (83.6% are aged > 60 years). In addition, elderly

**Table 1**  
Patient demographics.

	Mean $\pm$ standard deviation
Age (y)	72 $\pm$ 13
Free $Q_{\text{mean}}$ (mL/s)	7.4 $\pm$ 5.0
Free $Q_{\text{max}}$ (mL/s)	14.7 $\pm$ 9.5
Cystometric capacity (mL)	176.4 $\pm$ 119.9
BOOI	45.4 $\pm$ 34.3
Prostate volume (mL)	39.1 $\pm$ 20.1
IPP (cm)	0.66 $\pm$ 0.51
DWT (cm)	0.22 $\pm$ 0.07

BOOI = Bladder Outlet Obstruction Index; DWT = detrusor wall thickness; IPP = intravesical prostatic protrusion;  $Q_{\text{max}}$  = maximum flow rate;  $Q_{\text{mean}}$  = mean flow rate.

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